TITLE: ACID RAIN EFFECTS ON ALUMINUM MOBILIZATION CLARIFIED BY INCLUSION OF STRONG ORGANIC ACIDS

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Abstract: Assessments of acidic deposition effects on aquatic ecosystems have often been hindered by complications from naturally occurring organic acidity. Measurements of pH and ANC_G, the most commonly used indicators of chemical effects, can be substantially influenced by the presence of organic acids. Relationships between pH and inorganic Al, which is toxic to many forms of aquatic biota, are also altered by organic acids. However, when inorganic Al concentrations are plotted against ANC (the sum of Ca^{2+}, Mg^{2+}, Na^{+}, and K^{+}, minus SO_4^{2-}, NO_3^{-}, and Cl^{-}), a distinct threshold for Al mobilization becomes apparent. If the concentration of strong organic anions is included as a negative component of ANC, the threshold occurs at an ANC value of approximately zero, the value expected from theoretical charge balance constraints. This adjusted ANC is termed the base-cation surplus. The threshold relationship between the base-cation surplus and Al was shown with data from approximately 200 streams in the Adirondack region of New York, during periods with low and high dissolved organic carbon concentrations, and for an additional stream from the Catskill region of New York. These results indicate that (1) strong organic anions can contribute to the mobilization of inorganic Al in combination with SO_4^{2-} and NO_3^{-}, and (2) the presence of inorganic Al in surface waters is an unambiguous indication of acidic deposition effects.

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